Topography

National Park Service
U.S. Department of the Interior

Manassas National Battlefield Park

The effect of underlying geology on topographic relief within the park

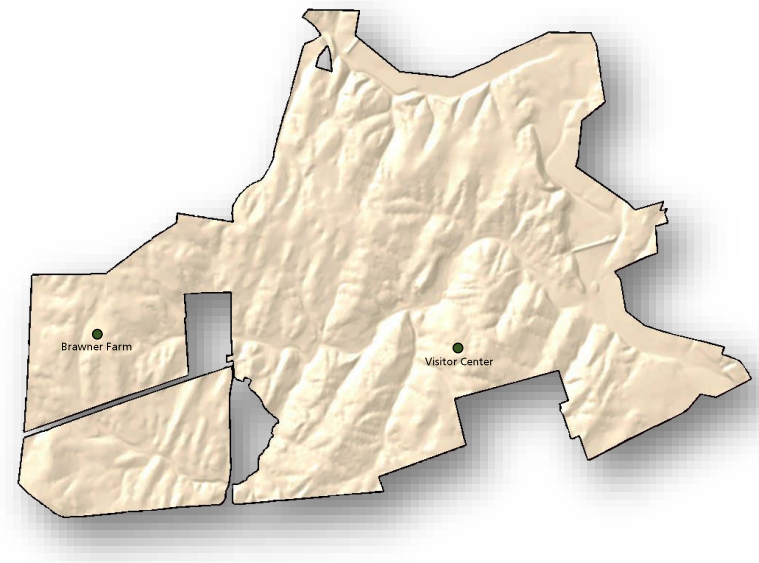
Have you ever noticed how the land rises and falls beneath your feet as you walk across a landscape? Or how rivers twist and turn through the mountains carving valleys on their way to the sea? Earth's surface is a collage of different shapes, each piece unique. These shapes, these highs and lows, lines and curves, they all work hand in hand to create Earth's topography.

Imagine Mother Nature as a sculptor and the earth as her masterpiece. To begin, she starts with a canvas covered by rocks and vegetation, each square inch characterized by a different variety of the two. In order to create the surface we stand on today each contour of the earth is sculpted by wind, water, and living organisms. Some parts of her canvas crumble with the lightest of breezes while other parts appear untouched even with the mightiest of storms.

Thus, the earth's topography is a product of weathering and erosion. As material is broken down into tiny pieces, a process known as weathering, it becomes easier for the material to be carried away. When the next strong wind or rain comes along the smaller particles get picked up and carried away, eroding the source rock.

Because all rocks are different, some weather and erode more quickly than others. Sedimentary rocks tend to break down the fastest unless the rock is well-cemented and thereby contains few pore spaces. Metamorphic and Igneous rocks break down more slowly because there are no pore spaces for water or roots to easily sneak into making it harder to wear down the rock.

Weathering and Erosion along Youngs Branch.



Shaded relief profile of Manassas National Battlefield Park.

Manassas National Battlefield Park has 3 main rock types, each of which erode at different rates. The Diabase in the west erodes the slowest, and gives meaning to the name Stoney Ridge located out by Brawner farm. Stoney Ridge has one of the greater elevations in the region, providing a key location to look out across the battlefield of Second Manassas.

To the east, the differences in topography are mainly dictated by the subtle shifts between siltstones and sandstones of the Groveton member. Sandstones are usually more resistant to erosion, fostering some of the higher reliefs in the region. Meanwhile, the abundance of clay in siltstone absorbs water, expands, and effectively dissolves into mud.

The highs and lows of the park are dominantly carved by the streams and rivers cutting through the park. As water flows downstream, it incises down into the bedrock., breaking the rock apart and carrying small sediment through the watershed, to Chesapeake Bay, and eventually into the Atlantic Ocean. As sediment is removed the elevation drops, creating valleys along the water ways. Can you tell where the streams flow based on the shaded relief map above?

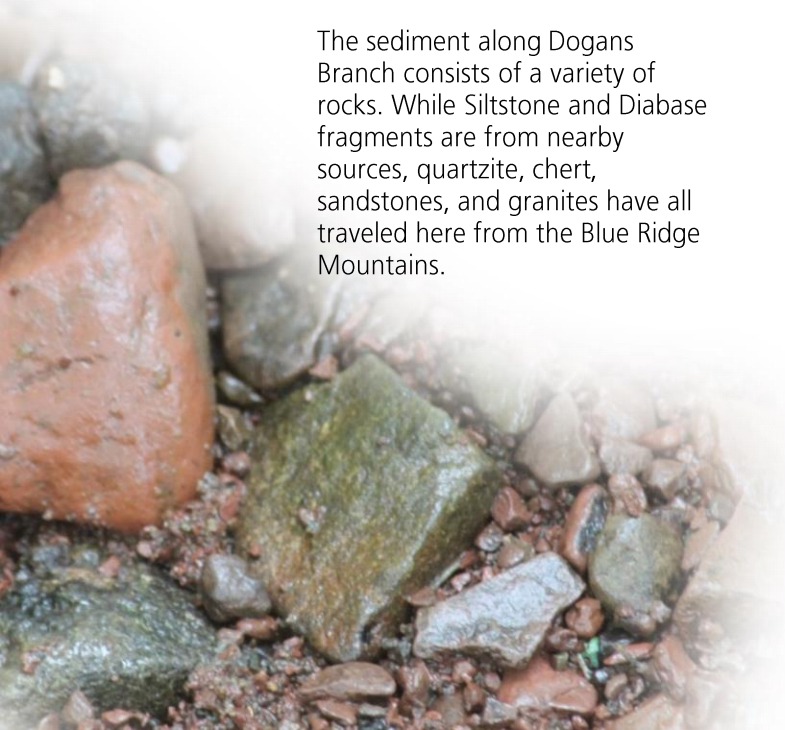
Role of erosion

Erosional processes are constantly occurring all around us. Every time sediment is carried away its source rock loses mass, decreasing in elevation (even if it's on a microscopic scale). However, for those of you familiar with physics, you'll recall that matter can neither be created nor destroyed. So where does this sediment go?

A majority of sediment becomes entrapped as rain rolls down hills into valleys below. This rain and sediment then mix into the waterways which actively carve the valley. Once in the water, the sediment is free to flow downstream traveling long distances until it finally settles out and accumulates on a river bank, delta, or perhaps even the continental shelf.

Over time loose sediment from all over a watershed will accumulate, be buried by other sediment, and eventually lithify into a brand new rock. As you stand along one of the streams in the park look at the rock fragments at your feet. Do they all look a like? Even here our creek beds host a variety of rocks which have traveled all the way from the Blue Ridge Mountains to the West.

Now keep in mind, wind and water don't only transport rocks and sediment; They also transport trash and pollutants. Thus, it's important for us to make sure we keep our earth clean because with enough time and transport, anything we leave on Earth's surface can end up in the ocean.



The sediment along Dogans Branch consists of a variety of rocks. While Siltstone and Diabase fragments are from nearby sources, quartzite, chert, sandstones, and granites have all traveled here from the Blue Ridge Mountains.

Not all lose sediment is eroded away though. Some loose sediment simply undergoes extensive weathering, producing soils which remain in place. In fact, in some places in the park you can witness the transformation from rock to soil as vegetation burrows down and breaks the rock apart.

The effect of weathering has produced two different soils within the park. The siltstone to the east produces a very acidic soil, deep red in color, while the diabase to the west produces a calcium rich soil, fostering a unique Oak forest ecosystem.

Deep red, alkaline soil produced by the siltstone around Stone Bridge.

Ultimately, erosion is a key process in shaping both the soils and the topography around us. The paths we chose to travel and the places we choose to live and work are all dictated by this simple process. Farmers must work in low lying areas where soil accumulates due to low erosion rates. Soldiers of the Civil War used to traverse the landscape by following naturally flat paths through the local valleys. Houses must be built away from rivers and coast lines in order to minimize the risk of the land eroded out from beneath the foundation.

While erosion is responsible for creating the beautiful landscapes around us, it's a process which has increased due to human activity. To help prevent erosion it's important to foster plant growth, thereby using roots to anchor soil and loose sediment in place. Furthermore, it is our duty to understand the limits of the earth around us so that we all make responsible choices to help prevent soil loss, pollution, and large scale erosional events such as landslides.